

Increasing Production, Improving Product Quality, and Empowering the Cracker Entrepreneur Group in Ngelom Pesantren Village

(Peningkatan Produksi, Perbaikan Kualitas Produk, dan Pemberdayaan Kelompok Pengusaha Kerupuk di Desa Ngelom Pesantren)

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ABSTRACT

This community service aims to assist by disseminating technology related to production equipment, which will help increase both the quantity and quality of products. Additionally, the program offers training on oil quality and teaches how to process waste cooking oil into soap. This community service activity is a way to achieve SDGs in the Decent Work and Economic Growth category through Small Entrepreneur and the Rural Economy. The activities were held in Ngelom Pesantren Village from April until September 2023 to overcome the priority problems that exist in the cracker entrepreneur group. The participants of this activity were a group of cracker entrepreneurs in Ngelom Pesantren Village, totaling 30 participants. Activities were carried out through research methods, workshops, and procurement of tools to improve the production process and quality of cracker products. The workshop topics covered halal certification of food products, oil quality standards, and making soap from waste cooking oil. The survey results showed that participants had a satisfaction level of 92% towards the activities and 93% towards the procurement of tools provided, and the production increased by 202.78%. In addition, the crackers are less greasy and the packaging is well-sealed, which can improve the quality of cracker products.

Keywords: cracker, production, quality, rural economy, small entrepreneur

ABSTRAK

Pengabdian kepada masyarakat ini bertujuan untuk membantu menyebarkan teknologi terkait peralatan produksi yang dapat membantu peningkatan kuantitas dan kualitas produk. Selain itu, program ini memberikan pelatihan tentang kualitas minyak dan mengajarkan cara mengolah minyak jelantah menjadi sabun. Kegiatan pengabdian kepada masyarakat ini merupakan salah satu cara untuk mencapai SDGs dalam kategori Pekerjaan Layak dan Pertumbuhan Ekonomi melalui Pengusaha Kecil dan Ekonomi Pedesaan. Kegiatan ini dilaksanakan di Desa Pesantren Ngelom pada bulan April sampai dengan September 2023 untuk mengatasi permasalahan prioritas yang ada pada kelompok pengusaha kerupuk. Peserta kegiatan ini adalah kelompok pengusaha kerupuk di Desa Pesantren Ngelom yang berjumlah 30 peserta. Kegiatan dilakukan melalui metode penelitian, workshop, dan pengadaan alat untuk meningkatkan proses produksi dan kualitas produk kerupuk. Topik workshop meliputi sertifikasi halal produk pangan, standar mutu minyak, dan pembuatan sabun dari minyak jelantah. Hasil survei menunjukkan bahwa peserta memiliki tingkat kepuasan sebesar 92% terhadap kegiatan dan 93% terhadap pengadaan alat yang disediakan, serta produksi meningkat sebesar 202,78%. Selain itu, produk kerupuk yang dihasilkan menjadi tidak terlalu berminyak dan kemasannya tertutup rapat, sehingga dapat meningkatkan kualitas produk kerupuk.

Kata kunci: ekonomi pedesaan, kerupuk, kualitas, pengusaha kecil, produksi

INTRODUCTION

One of the goals for realizing Sustainable Development Goals (SDGs) in Indonesia is to increase inclusive and sustainable economic growth, productive and comprehensive employment opportunities, and decent work (Alisjahbana & Murniningtyas 2018). The COVID-19 pandemic hurts the global economy. In an effort to revive the Indonesian economy, the government has a program that aligns with the SDGs. One important category is decent work and economic growth. Decent work opportunities should be provided for all citizens irrespective of differences in age, gender, or disability (Ponto, 2023). Economic growth focuses on several things, including: 1) Increasing the productivity of goods and services; 2) Investment; 3) Expanding opportunities and labor absorption; 4) Reducing unemployment; 5) Creating and disseminating innovation; 6) Supporting science and technology; and 7) Increasing competitiveness (Pamungkas *et al.* 2018).

University community service can be an activity for realizing SDGs Decent Work and Economic Growth through the keywords Small Entrepreneurs and Rural Economy. Rural economy can be defined as the act of entrepreneurship in rural areas, either individuals or communities, or the industrialization of a rural area (Onahring & Singh 2020; Zulys *et al.* 2023). The selection of community service locations is adjusted to the economic conditions and problems in the area through a situation analysis first. One of the locations chosen is Ngelom Pesantren Village, Taman District, Sidoarjo Regency, East Java Province, Indonesia.

Most people in Ngelom Village work in education and entrepreneurship. Their women aged around 40-85 have the expertise to make crackers for generations. There are various types of crackers from Ngelom Pesantren, including Payus Fish Cracker, Garlic Crackers, Buron Alas Crackers, and Rengginang with various flavors such as shrimp, fish, and terasi. Crackers are sold in two conditions: raw instant crackers and fried crackers (ready to serve). The prices of crackers vary. For example, payus fish crackers are sold for Rp. 40,000-80,000/Kg depending on the quality of payus fish used, while rengginang is sold for Rp. 35,000-60,000/Kg, depending on the flavor. The entrepreneurs market their products through local community networks. The marketing strategy used so far is word of mouth

(WOM) and sold through shops and stalls around the village, which is a busy area. Ngelom crackers have a dedicated fan base, especially during Ramadan or when the holidays are approaching. Sometimes, the entrepreneurs are pretty overwhelmed in the production process when orders increase. The crackers are often ordered as souvenirs from outside the city and abroad, such as Saudi Arabia. The crackers are also popular for special occasions, proposals, and weddings, with unique shapes like ducks, flowers, peacocks, and more. The existence of these products shows that crackers can be used as gifts and can be a creativity platform with a high enough selling value without reducing their functional value as food.

Ngelom Village's cracker entrepreneurs consist of two groups: 1) those who produce crackers from raw materials to raw instant crackers and 2) those who fry and package crackers until they are ready for consumption. Both groups are often partnered based on consumer demand. The frying group exists because crackers must be fried at the right temperature and conditions to puff completely. Proper frying techniques can result in fully puffed crackers, such as frying twice in oil at different temperatures and frying after drying. Therefore, some consumers often minimize this problem through the services of a cracker frying group.

The primary raw materials in making crackers are flour, spices, and fish. Payus fish is the main ingredient in making Payus fish crackers. Besides tasting good, Payus fish also has a high nutritional content. (Sonyenzellnd *et al.* 2015). These ingredients can be obtained from the surrounding market, the Sepanjang market, which is only 1 km from Ngelom Pesantren village. Non-fish crackers can be produced at any time due to the availability of the ingredients. Payus fish is currently fluctuating, causing the price of fish to be relatively expensive, so alternative raw materials with high protein and meat texture characteristics resemble Payus fish that is Bulan-Bulan fish, known as Tarpon. (Mufarihat *et al.* 2019). In the frying group, oil is the primary raw material. The quality of the oil is also a factor in the success of frying. Bulk oil and waste cooking oil (WCO) are avoided in this process. The increasingly high price of oil concerns entrepreneurs, so some consumers also bring their own oil. A study on the quality standards of cooking oil that refers to SNI 3741:2013 Quality Requirements for Cooking Oil is needed to

increase entrepreneurs' knowledge regarding the dangers of low-quality oil for health. (Badan Standardisasi Nasional, 2002).

In the production process, the cracker dough is steamed in a steamer pot. Some producers only have one steamer, but as production demand increases, it is necessary to have a multi-tiered steamer available. After some time, the cooked dough is allowed to cool and then cut into thin slices with a knife. At this stage, cutting is done slowly to get thin and perfect slices; it is better to use a cutting machine to facilitate the cutting process and minimize time to make the process more efficient. The thinly sliced cracker dough is dried in the sun for about two days to remove the moisture content so that the crackers can be stored for a long time without mold. In addition, the drying process also affects the texture of the crackers produced later. The texture of the crackers will be hard/tough if the drying process is not done properly.

In the frying process, two pans are filled with enough hot oil with different heating temperatures that can be adjusted through the stove fire. The crackers to be fried must be slightly warm directly after drying. The crackers must be submerged in the oil to distribute heat evenly. After the crackers are puffed, they are moved to the second frying pan and waited until they are fully puffed, slightly browned, then drained. During this time, the oil draining process is done manually using a scraper. A spinner machine is undoubtedly helpful in the oil draining process to reduce the crackers' oil content so that they are less greasy and last longer. Furthermore, the crackers are packaged according to consumer

demand, packaged in units per 1 kg, per 5 kg, or others. The packing process uses plastic heated with a flame on wax to seal the plastic. In this case, a sealer machine is undoubtedly beneficial to speed up production and process safety.

The partner of this community service program is a cracker entrepreneur in Ngelom Pesantren Village. The observation results indicate that the partner's primary concerns are related to the cracker production process and the quality of cracker products. This community service aims to provide solutions and targets for each priority aspect of the problem, with the expected result being an improved cracker production process and quality. Additionally, it is essential to provide training on oil quality for health and the processing of WCO into soap. This training is crucial for the cracker frying group to ensure the quality of their fried crackers and to provide practical solutions for processing WCO.

METHOD OF IMPLEMENTING ACTIVITIES

The community service activities were carried out over six months, from April to September 2023, with mentoring and workshop methods. The target of this activity was a group of cracker entrepreneurs in Ngelom Pesantren Village and the local community, who are also related to cracker entrepreneurs, with 30 participants. To achieve the goal of increasing production and product quality for the Ngelom Pesantren Village cracker entrepreneur group, the activities depicted in Figure 1 were implemented in the following steps: 1) Testing of WCO from cracker



Figure 1 Community service activity steps.

frying in the laboratory of Department of Chemistry, FST UNAIR; 2) Making a secret recipe book for Ngelom crackers; 3) Engineering and procurement of tools to increase the production and quality of Ngelom Pesantren Village crackers; 4) Handover of tools used in the production process to the Ngelom Pesantren Village cracker entrepreneur group; 5) Providing an understanding of the flow and procedures for applying for halal certification; 6) Education about the quality standards of cooking oil and waste cooking oil (WCO); 7) workshop on the utilization of WCO into liquid soap and its practice; 8) Questions and answers related to the material that has been delivered; 9) Monitoring and mentoring; and 10) Evaluation of activities to find out feedback from participants. The evaluation is carried out through a survey of participants by filling out pre-test, post-test, and questionnaires, which aim to determine the level of usefulness of tools, feasibility, and success of activities. The evaluation is carried out through a survey of participants by filling out pre-test, post-test, and questionnaires, which aim to determine the level of usefulness of tools, feasibility, and success of activities (Widati *et al.* 2024).

The qualitative and quantitative tests for oil quality standards use WCO from cracker frying, which will later be utilized as raw materials for making soap. The reagents for tests are 95% ethanol, phenolphthalein (PP) indicator, NaOH 0.1 N, KOH 0.1 N, KOH 0.05 N, chloroform, glacial acetic acid, KI saturated solution, distilled water, amylum indicator, Na₂S₂O₃ 0.1 N solution, and 10% KI. The reagents for producing liquid soap are 10% KOH solution, distilled water, foam booster, fragrance, and coloring.

The test methods for WCO are: 1) Determination of water content by weighing 2 grams of WCO in a dry cup that has a known weight, then heating in an oven at 105°C for 4 hours (Lembang *et al.* 2016). After that, the sample is cooled in a desiccator for ± 15 minutes

and weighed. Drying was carried out again until a constant weight was obtained; 2) Determination of Free Fatty Acid (FFA) content by putting 2 grams of WCO into an erlenmeyer, then adding 50 ml of 95% ethanol and 2–3 drops of phenolphthalein indicator, then titrated with KOH 0.1 N; 3) Determination of acid number by putting 10 grams of WCO into a glass beaker, adding 50 ml of 95% ethanol, then heated at 50°C while stirring for ± 10 minutes until the oil is completely dissolved. After that the solution was added 2–3 drops of PP indicator and titrated with KOH 0.05 N; and 4) Determination of peroxide number was carried out by putting 10 grams of WCO into an erlenmeyer with a lid of 250 mL, then adding 12 mL of chloroform and 18 mL of glacial acetic acid then the erlenmeyer was closed and shaken until the oil was dissolved. After that, 0.5 mL of KI saturated solution was added and kept shaking for 1 minute, then 30 mL of distilled water and 0.5 mL of 1% amylum were added, and the solution was immediately titrated with Na₂S₂O₃ 0.1 N until the blue color disappeared. Each method of testing WCO was carried three times (triplo) and calculated using the equation presented in Table 1.

RESULT AND DISCUSSION

The results and discussion of these community service activities can be categorized into five main topics. These include preparing activities and creating a recipe book, designing and procuring tools, quality testing results of WCO, implementing activities, and evaluating the activities.

Preparing Activities and Creating Recipe Book

Preparation begins with forming a team consisting of lecturers and students. The team plans the activities and coordinates offline and

Table 1 Equation formula for determining moisture content, FFA, acid number, and peroxide number

Parameters test	Equation formula
Water content (%)	$\frac{m \text{ before drying (g)} - m \text{ after drying (g)}}{m \text{ waste cooking oil (g)}} \times 100\%$
FFA (%)	$\frac{V \text{ KOH (mL)} \times N \text{ KOH (N)} \times Mr \text{ waste oil } \left(\frac{\text{g}}{\text{mol}}\right)}{m \text{ waste oil (g)} \times 10}$
Acid number (mg KOH/g)	$\frac{V \text{ KOH (mL)} \times N \text{ KOH (N)} \times Mr \text{ KOH } \left(\frac{\text{g}}{\text{mol}}\right)}{m \text{ waste oil (g)}}$
Peroxide number (meq O ₂ /kg)	$\frac{V \text{ Na}_2\text{S}_2\text{O}_3 \text{ (mL)} \times N \text{ Na}_2\text{S}_2\text{O}_3 \text{ (N)} \times 1000}{m \text{ waste oil (g)}}$

online through the WhatsApp Groups and Zoom Meetings. Furthermore, the team coordinated with the cracker entrepreneurs regarding permission, equipment, and activity plans. The team collected cracker recipes from every cracker entrepreneur in Ngelom Pesantren Village. The recipes were compiled into one menu book, shown in Figure 2. The menu book contains nine recipes and how to make them. These recipes have been collected from five senior cracker entrepreneurs who have been in the Ngelom cracker business for a long time. This recipe book aims to document and preserve Ngelom crackers so they can continue to exist. The recipe book was printed and distributed to the entrepreneur's family members. The recipe book can serve as a reference so that cracker production can continue from generation to generation. (Wibowo *et al.* 2020).

Designing and Procuring Tools

The team coordinated with the entrepreneurs to find out the production equipment needs of every entrepreneur so the equipment procurement could be on target. The main target is equipment that can improve the production process and product quality. These include a multi-tiered steamer that can provide fast and even heat, making the production process more efficient. A cracker cutter that is hands-on and effective in cutting crackers to the desired thickness. An oil spinner to produce less greasy crackers and prevent rancidity quickly. An energy-saving plastic sealer machine has been designed (Figure 3) for efficient packaging, which replaces the conventional candle flame method because of the high risk. The sealer plastic can seal the cracker packaging so that the packaging is tight and the crackers' quality is guaranteed. Several supporting tools, such as a thousand-fire stove and blender, are also procured. This Community Service activity design and procurement of tools is based on providing solutions to the problem's priority aspects.

Quality Testing Results of WCO

Testing the quality standards of WCO from cracker frying in Ngelom Village consists of water

content, Free Fatty Acid (FFA), acid number, and peroxide number. Increasing this parameter can occur due to heating (Manurung *et al.* 2018). Quality testing result of WCO are shown in Table 2.

The water content test is carried out by heating the WCO until it gets a constant weight. To ensure consistent results, the variation among replicate measurements should not exceed 10% of the mean value for water content and volatile matter content (Devianti *et al.* 2025). When the weight of WCO is constant, the water in the oil evaporates. The water content test is repeated three times (triplo) to get accurate results and reduce errors during titration, in equipment cleanliness, and human error factors (Ulfindrayani & A'yuni 2018). Water content in WCO from cracker frying amounted to 0.10%.

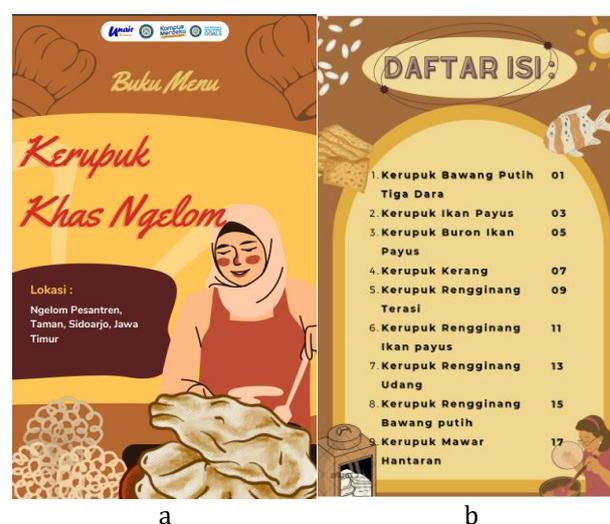


Figure 2 a and b) Recipe book Ngelom cracker.



Figure 3 Design of sealer plastic.

Table 2 Test analysis results of WCO from frying cracker (information: Q = Qualified; NQ = Not Qualified)

Parameters test	Result	Quality Standart (SNI)	Note
Water content (%)	0.10 ± 0.01	≤ 0.15	Q
Free Fatty Acid content (%)	0.85 ± 0.07	≤ 0.30	NQ
Acid number (mg KOH/g)	1.38 ± 0.09	≤ 0.60	NQ
Peroxide number (mek O ₂ /kg)	5.33 ± 1.15	≤ 10	Q

According to SNI 3741:2013, the moisture content in cooking oil is $\leq 0.15\%$, so the WCO still meets the SNI quality standards in the term of moisture content. The moisture content is not too high because the crackers are dried in the sun before frying.

The next quantitative test is FFA content using the acid-base titration method. The test method was adopted from the research of Lempang *et al.* 2016 and Rahkadima & A'yuni 2017. The addition of alcohol (ethanol) aims to dissolve the WCO so that it can react with the alkali easily during the titration process (Lempang *et al.* 2016; Rahkadima & A'yuni, 2017). The FFA content in WCO from cracker frying amounted to 0.85%. These results do not comply with the requirements set by SNI 01-3741-1995, which is a maximum of 0.30% (Yulia *et al.* 2017).

The following quality standard test for WCO is acid number. The results of the acid number analysis showed a figure of 1.38 mg KOH/g. This result does not align with the quality standard of SNI 3741:2013, which is a maximum of 0.60 mg KOH/g. SNI 3741:2013 Cooking Oil is a revision of SNI 01-3741-2002, and SNI 01-3741-2002 is a revision of SNI 01-3741-1995. However, SNI 01-3741-1995 is still used to determine the FFA quality standard limits.

The last quantitative test is the peroxide number. Peroxide is a labile compound that quickly reacts further to form ketone and aldehyde compounds that cause rancidity in oil. (Suroso 2013). The results of the peroxide number analysis showed 5.33 mek O_2 /kg. The peroxide number of the sample is ≤ 10 mek O_2 /kg, so it still meets the quality standards of SNI 3741: 2013 (Badan Standardisasi Nasional 2013). WCO that has been damaged will occur oxidation, polymerization and hydrolysis processes. The process produces toxic peroxides and free fatty acids that are difficult to digest by the body (Tuasamu 2018).

Consumption of WCO can cause various types of health problems. These include damage to the small intestine, blood vessels, heart, and liver. The organ damage is due to free radicals from the oxidation of cooking oil fatty acids. Free radicals will disrupt membrane permeability, osmotic homeostasis, and the integrity of enzymes that cause death (Megawati & Muhartono 2019).

Based on these results, it is known that the FFA content and acid number of WCO from cracker frying do not qualify for SNI 3741:2013 concerning cooking oil quality standards. Therefore, the entrepreneurs have never reused

the oil since the beginning. In addition to health reasons, the use of WCO can affect the quality of fried crackers, making them rancid and dark in color. During this time, WCO from cracker frying is always given to WCO collectors for free.

Implementation Activity

Community service activities were conducted through workshops and training held at the Bahauddin Junior High School building in Ngelom Village. The profile of partners comprises a group of cracker entrepreneurs from Ngelom Pesantren Village and the local community, who are also related to cracker entrepreneurs, totalling 30 participants. The activity began with a speech by the Head of the Chemistry Master Study Program, an Airlangga University service team representative. It continued with a speech from a representative of the Ngelom Village cracker entrepreneur to introduce the cracker business in Ngelom Village. The opening of the community service activity is shown in Figure 4.

The activity continued with the handover of equipment procurement aimed at improving crackers' production process and quality. The equipment handover was represented by Universitas Airlangga and the Ngelom Pesantren Village Cracker Entrepreneurs, as shown in Figure 5.

The workshop and training participants must take a pre-test before starting the activity. This pre-test can be used to evaluate the effectiveness of the training later on. The pre-test covers topics such as the socialization of halal certification, cooking oil quality standards, and the utilization of WCO in soap making. The training on halal certification of food products, shown in Figure 5, aimed to increase entrepreneurs' knowledge about the importance of the halal logo and to ensure the quality of Ngelom cracker products for wider marketing. The training was followed by a



Figure 4 Opening of community service activity.



Figure 5 a, b, c, and d) Handover of equipment.

question-and-answer session, and participants who actively asked questions received appreciation in the form of door prizes, as shown in Figure 6.

The second topic is the test results of WCO conducted at the Department of Chemistry Laboratory, FST Unair. The laboratory test results are explained to educate local entrepreneurs and their communities regarding the decrease in cooking oil quality after being heated, SNI 3741: 2013 Quality Requirements for Cooking Oil, and an appeal to the public to avoid using WCO in daily life.

In this case, Ngelom cracker entrepreneurs never used WCO because it can affect the quality of cracker products in terms of color, smell, and durability. It ensures that Ngelom crackers are of good quality and guaranteed. The WCO produced by cracker frying is given away to collectors for free. Therefore, this workshop is given to utilize the WCO into soap so that the community can be empowered to utilize the waste around them as a high-value and economical item. Providing workshop on utilizing WCO into soap as a form of community empowerment by providing education and training to the community. Community empowerment aims to enable and empower the community by creating a climate



Figure 6 a) Training on halal certification of food products and b) Giving door prizes

that allows community potential to develop (enabling) and strengthens the community's potential or power (empowering) (Hasan & Aziz 2018).

This training is complemented by the practice of making soap from WCO which can be seen in Figure 7. The practice provides participants with a direct description of the tools, materials, and procedures for making soap from WCO. After the soap-making practice, this activity was completed with a trial of a liquid soap product and a question-and-answer session.

The saponification reaction, also known as the process of making soap, is the alkaline hydrolysis of triglyceride in aqueous medium. These esters are the major constituents of vegetable oils and animal fats. Triglyceride reacts with a strong mineral base like potassium hydroxide to

produce glycerol and the potassium salts of the hydrolyzed free fatty acids (Félix *et al.* 2017). In WCO with high FFA content, the reaction can occur between FFA and base to produce soap and water. The reactions are shown in Figure 8. Eventually, the saponification reaction produces the glycerol/glycerin as excess and the salt of the carboxylic acid as a crude soap. (Azme *et al.* 2023).

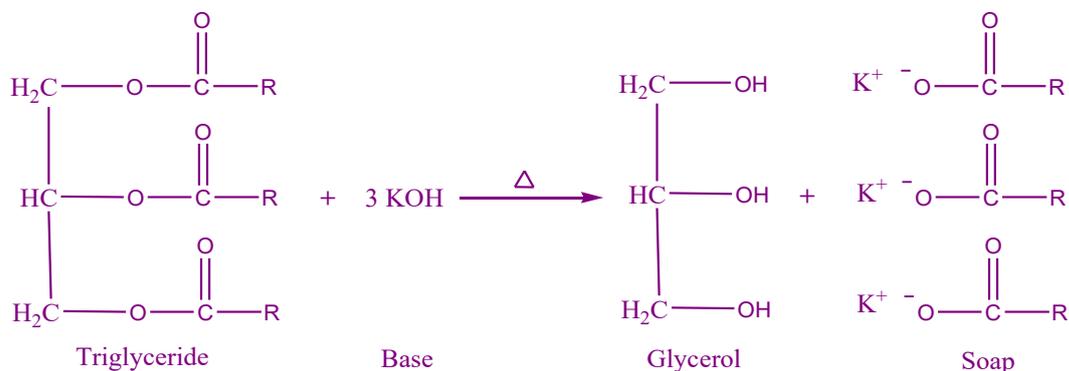
Evaluation Activity

Evaluation of Community Service activities is carried out as pre-test, post-test, activity satisfaction survey, and satisfaction and usefulness survey of tools. The first evaluation we conducted a pre-test and post-test to assess the participant's understanding of the subject presented. The pre-test is given before the



Figure 7 a) Workshop on the harms of waste cooking oil, and b) Practice of making soap from waste cooking oil.

Reaction I :



Reaction II :

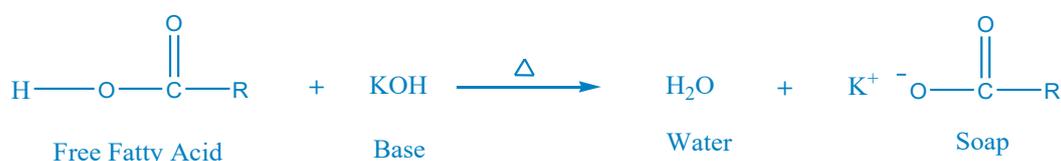


Figure 8 Saponification reaction to soap formation from waste cooking oil.

subject is delivered, while the post-test is given after the subject is delivered (A'yuni *et al.* 2022). The highest score obtained by participants during the pre-test was 60, while during the post-test was 95. The score data is shown in Figure 9.

The comparison presented as a bar chart in Figure 9 shows that the range of scores has increased from 10-60 to 55-95. The average pre-test score was 27, while the average post-test score was 80, which showed a 3× increase from the pre-test score. The score with the highest frequency during the post-test was 85, as many as 9 people. Community service activities increase community knowledge about halal certification procedures for food products,

cooking oil quality standards, and making soap from WCO.

The second evaluation is a satisfaction survey in a questionnaire of 10 questions with 5 scales. The survey results are processed as a bar chart presented in Figure 10. The results of the data analysis of respondents' satisfaction level questionnaires show that the average percentage of satisfaction is 92%, with 10 aspects evaluated. This figure shows that the level of community satisfaction is high with the activities organized in the framework of community service (A'yuni *et al.* 2023). This satisfaction includes aspects of the material, speakers, media, and facilities provided during the activity (Table 3).

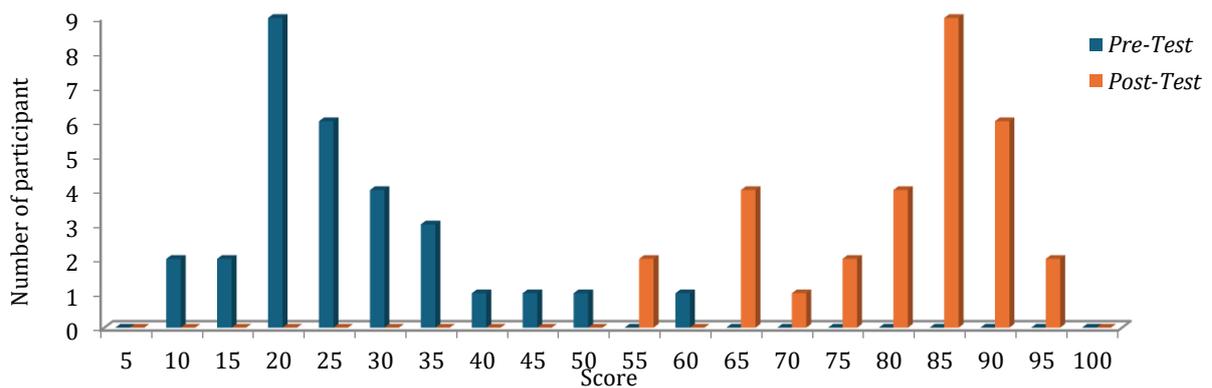


Figure 9 Participants' pre-test and post-test results related to the workshop topics.

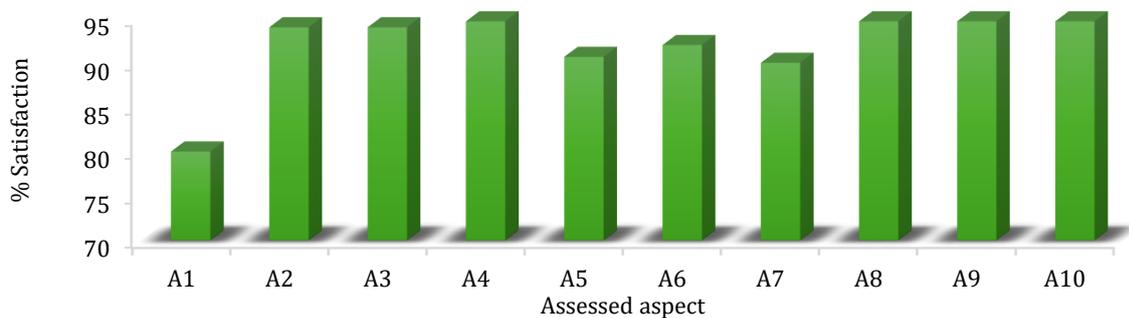


Figure 10 Participant satisfaction survey results.

Table 3 The aspect in the questionnaire of participation satisfaction

Aspect ID	Aspect point
A1	Appropriateness of the topic presented for the current condition
A2	Suitability of material delivery media (lectures and practices) with current conditions
A3	The level of ease of material to be understood
A4	The usefulness of activities for the community
A5	Ease of material to be practiced
A6	The level of possibility that the material can be developed as a home-based business
A7	Opportunity for participants to ask questions
A8	Speaker's response to participants' questions
A9	Speaker's level of expertise
A10	Feasibility of activity facilities (venue, consumption, souvenirs)

The third evaluation concerns the tools provided to improve crackers production process and quality in Ngelom Village. The evaluation used a questionnaire with 5 questions with 5 rating scales. The results of the evaluation of satisfaction and usefulness of the tools are shown in Figure 11. The highest average percentage of satisfaction lies in the suitability of the tools to the needs of each cracker entrepreneur. The aspect of tool suitability received a 96% score, indicating the tools provided were right on target according to the needs of the entrepreneurs. The third question in the questionnaire (Table 4, A3) asked participants to fill in the number of crackers produced before and after using the tools. The results showed that all entrepreneurs experienced an increase in production of 202.78%. Besides that, the crackers are less greasy and the packaging is well sealed. This data showed a trendline of 93%, indicating that participants were very satisfied with procuring tools to improve crackers production process and quality.

According to the participants' questionnaire responses, community service activities have proven beneficial for the cracker entrepreneurs of Ngelom Pesantren Village by improving the production process and quality of the crackers. The training sessions also provide education on

halal certification for food products, quality standards for cooking oil, and the utilization of WCO into soap, which empowers the entrepreneurs and the surrounding community.

The challenges encountered in this activity include the limited provision of tools, which only cover the essential equipment needed by each cracker entrepreneur and do not extend to supporting tools. This limitation arises from the restricted grant funds available. Additionally, more intensive assistance is required for halal certification applications. Furthermore, the soap products produced in the workshop still need to undergo suitability testing before they can be marketed. Despite these challenges, the impact of this activity has been positive, as cracker entrepreneurs are now more enthusiastic about advancing their businesses. They have also become more mindful of product quality and the use of cooking oil waste to support environmental preservation.

To ensure the sustainability of this program, long-term collaboration is essential. This could involve providing additional training in areas such as business management, marketing, financial management, and obtaining halal certification, along with technical and financial support. By addressing these challenges and maximizing the program's impact and sustain-

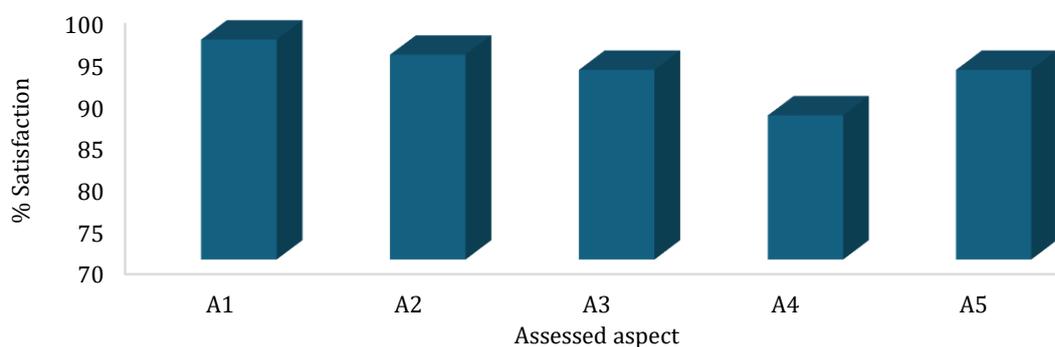


Figure 11 Tool satisfaction survey results.

Table 4 The aspect in the questionnaire of tool satisfaction

Aspect ID	Aspect point
A1	Suitability of the tool to the needs
A2	Quality of the tools provided
A3	Increase in cracker production before and after using the tool (before = kg/day and after = kg/day)
A4	improvement in the quality of crackers before and after using the tool
A5	Ease of use of the tool

nability, these activities will provide greater benefits for the community and local economy in the future.

This community service activity supports the achievement of SDGs Decent Work and Economic Growth through the keywords Small Entrepreneurs and Rural Economy. Decent work is essential to reducing poverty and achieving equitable, inclusive, and sustainable development.

CONCLUSION

Community service activities have been successfully implemented to improve production and quality, as well as empower the cracker entrepreneur group through providing dissemination technology and training. The activities were carried out using mentoring and workshop methods, which were considered very satisfying, with an average satisfaction percentage of 92%. Workshop activities increased participants' knowledge about the benefits and procedures for halal certification, quality standards for cooking oil, and utilization of WCO into soap. Procuring tools as part of the community service also improved the production process and quality of crackers in Ngelom Pesantren Village, with a satisfaction percentage of 93%. It could increase cracker production by 202.78% and the crackers are less greasy and the packaging is well sealed. Community service positively impacts cracker entrepreneurs in Ngelom Village and realizes the achievement of SDGs for the Decent Work and Economic Growth category through the keywords Small Entrepreneurs and Rural Economy.

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